

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P021570WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/GB 03/02640	International filing date (day/month/year) 20.06.2003	Priority date (day/month/year) 13.07.2002
International Patent Classification (IPC) or both national classification and IPC C25D7/10		
Applicant DANA CORPORATION et al.		


1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 04.02.2004	Date of completion of this report 05.11.2004
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Haering, C Telephone No. +49 89 2399-8010



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB 03/02640

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-15 as originally filed

Claims, Numbers

1-9 filed with telefax on 09.09.2004

Drawings, Sheets

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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International application No. **PCT/GB 03/02640**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-9
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-9
Industrial applicability (IA)	Yes: Claims	1-9
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

0. Amendments:

The set of claims as originally filed have been replaced by a new set of claims wherein claims 1 and 6 now include the fact that the overlay is made of pure tin, as supported by the description page 4, lines 4 to 10. The amendments thus meet the requirements of Article 34 PCT.

1. Disclosures:

- D1: WO 00 29647 A (STASCHKO KLAUS ;FEDERAL MOGUL WIESBADEN GMBH (DE); GRUENTHALER KAR) 25 May 2000 (2000-05-25)
- D2: DE 37 27 591 A (GLYCO METALL WERKE) 2 March 1989 (1989-03-02)
- D3: US-A-5 156 729 (MAHRUS DURAND ET AL) 20 October 1992 (1992-10-20)
- D4: EP-A-0 257 670 (AE PLC) 2 March 1988 (1988-03-02)
- D5: US-A-5 712 049 (MULLER KLAUS ET AL) 27 January 1998 (1998-01-27)
- D6: EP-A-0 379 948 (BLASBERG OBERFLAECHENTECH) 1 August 1990 (1990-08-01)
- D7: US-A-4 871 429 (NOBEL FRED I ET AL) 3 October 1989 (1989-10-03)

- 1.1. Documents D1 (see Abstract; p.4, last paragraph - p.7, last paragraph; Claim 1), and D2 (c.2, l.22 - c.3, l.33; examples 1,3) disclose a plain bearing first coated with nickel, cobalt, copper, silver or iron (= interlayer) and then with an overlay comprising tin, not made of pure tin. Arylpolyglycolether, alkylpolyglycolether Diethyleneglycol-dimethylether or toluol, benzol or xylol is used as leveller.
- 1.2. Document D3 discloses a plain bearing having alternatively soft layers of Cu-Sn-Pb and hard layers of Cu or Cu-Sn, the overlay being Cu-Sn-Pb (Claims 1, 2, 4).
- 1.3. Document D4 discloses a plain bearing first coated with a nickel based interlayer and then with an overlay based on tin, but comprising cobalt (Abstract; c.5, l.5-51).

Those documents are not considered as relevant.

- 1.4. Document D5 discloses a plain bearing first coated with an interlayer comprising nickel, cobalt, copper, zinc, or iron and then **with a pure tin overlay** (c.4, l.37-47). The plain bearing is electroplated in a bath comprising tin ions, a wetting agent and a grain refinement agent, at a current density within the range of 1 to 3 A/dm² (c.3, l.31-41; claims 1, 9, 11).
- 1.5. Document D6 discloses a tin plating bath comprising nonyl-phenolpolyglycolether as a wetting agent. The electroplating take place at a current density of 0,2 to 10 A/dm² (c. 3 - c. 4; examples 3, 4; claims 1, 2).

- 1.6. Document **D7** discloses a **tin plating bath comprising pyrocatechol as an antioxidant**. The electroplating takes place at a current density of 0,2 to 10 A/dm² (c. 3, l. 28-59).

2. Novelty:

- 2.1. Document D5 discloses a plain bearing from which the subject-matter of claim 1 differs in that the overlay contains an organic leveller in its overlay matrix.
The subject-matter of claim 1 is considered as formally novel regarding D5 (Article 33(1) and (2) PCT).
- 2.4. Dependent claims 2 to 5, and 7 to 9 a fortiori also meet the requirements of the PCT with respect to novelty.

3. Inventive step:

- 3.1. The nature of the wetting agent and the grain refiner in D5 is not further specified, and D5 is also silent whether these are dispersed with the matrix of the tin overlay which is formed, a wetting agent and a grain refiner.
- 3.2. In D6 and D7, cited as examples of disclosure of pure tin plating baths, **phenolpolyglycolether (D6) is used as a wetting agent**, and **pyrocatechol (D7) is used as an antioxidant** (the use of pyrocatechol seems to have another effect than the use of phenolpolyglycolether!). Those additives are well known in the art and commonly used in tin plating baths (also as so-called brighteners).
- 3.3. The skilled person, aware of the uncomplete disclosure, looking for adequate additive(s) for tin plating baths, would inevitably look for "simple" tin plating baths and would immediately be directed to baths as disclosed in D6 or D7 or others, thus coming to the leveller(s) of D6, or D7, as claimed in claim 2.
- 3.4. As additional remark, it seems doubtful whether the leveller used in the present application, which seems to be commonly used in tin plating baths, would bring any further improvements to the plain bearing of D5.
- 3.5. As a consequence, no inventive step can be acknowledged for the subject-matter of claim 1, and consequently neither for the subject-matter of claims 2 to 9, according to Article 33(1) and (3) PCT.

4. Clarity:

(Certain observations on the international application)

- 4.1. Claim 3 is not clear under Article 6 PCT, because it is written in terms of a result to be achieved, or better said in terms of an intrinsic property of the claimed bearing.
- 4.2. The relevant state of the art (D5) should have been mentioned in the description, according to the requirements of Rule 5.1(a)(ii) PCT.

Druckexemplar

CLAIMS

1. A plain bearing having an overlay alloy layer at a sliding surface of the plain bearing, the plain bearing comprising a layer of a strong backing material, a layer of a first bearing alloy bonded to the strong backing material and a layer of a second bearing material comprising said overlay material bonded to said first bearing alloy layer, characterised in that said second bearing material comprises essentially pure tin without any other metallic alloying constituents, other than unavoidable impurities, having included in the matrix thereof an organic levelling agent.
2. A plain bearing according to claim 1 wherein the organic material is selected from at least one of: nonylphenolpolyglycolether and pyrocatechol.
3. A plain bearing according to either claim 1 or claim 2 wherein the hardness of the overlay is in the range from about 20 to 30Hv.
4. A plain bearing according to any one preceding claim further including an interlayer between the surface of the first bearing material and the tin overlay to act as a diffusion barrier therebetween.
5. A plain bearing according to claim 4 wherein the interlayer is selected from the group comprising: nickel, cobalt, copper, silver, iron and alloys thereof.
6. A method for the deposition of an overlay layer onto the surface of a plain bearing, the bearing

comprising a strong backing material having a layer of a first bearing material thereon, said overlay being deposited upon the surface of said first bearing material, the method comprising the steps of: providing a bearing having a surface on which to deposit said overlay; immersing said bearing in a plating solution having a supply of tin ions and an organic levelling agent in said solution; making said bearing cathodic with respect to an anode in said solution; and depositing an overlay of essentially pure tin without any other metallic alloying constituents, apart from unavoidable impurities, said tin overlay also having said organic levelling agent included in a matrix thereof.

7. A method according to claim 6 wherein the overlay is deposited in a slot jig apparatus.

8. A method according to claim 7 wherein the plating solution is sparged through the slot towards the bearing bore.

9. A method according to either claim 6 or claim 7 wherein a plating current density lies in the range from 2 to 3 A/dm².